

Appl. No. 09/297,483
Amdt. Dated September 6, 2005
Reply to Office Action of June 9, 2005

Attorney Docket No. 81756.0003
Customer No.: 26021

REMARKS/ARGUMENTS:

Claims 51, 64, 66, 95, and 126 are amended. Claims 37-49, 51, 62, 64, 66, 83-95, and 113-126 are pending in the application. Reexamination and reconsideration of the application, as amended, are respectfully requested.

The present invention relates to a manufacturing process for an organic EL (electroluminescence) element, an electrically light-emitting element that may be used in displays, display light sources, and the like. In particular, it relates to a composition for use as a hole injecting and transporting layer suitable for ink jet patterning. (Applicant's specification, at p. 1, lines 8-14).

CLAIM REJECTIONS UNDER 35 U.S.C. § 112:

Claims 51, 64, 66, 95, and 126 stand rejected under 37 C.F.R § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention because they recite the limitation "said lubricant". The Office states, "There is insufficient antecedent basis for this limitation in the claim because Applicant has removed the requirement for a lubricant from parent claims 37, 62, and 113."

In response, the Applicant amended claims 51, 64, 66, 95, and 126 to insert "lubricant" as a limitation. Withdrawal of this rejection is thus respectfully requested.

CLAIM REJECTIONS UNDER 35 U.S.C. § 103:

Claims 113-126 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Nagayama et al. (U.S. Patent No. 5,701,055) in view of Woo et al. (U.S. Patent No. 6,169,163) and Pichler et al. (WO98/05187). The Applicant respectfully traverses this rejection. Claim 113 is as follows:

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An organic EL element, having a stacked structure including a hole injecting or transporting layer and a light-emitting layer formed within a partitioning member which is divided into individual pixel areas, manufactured by a manufacturing process, comprising:

forming a plurality of anode layers

forming the partitioning member over a substrate, the partitioning member lying at least between adjacent ones of the plurality of anode layers so as to independently partition the adjacent ones of the plurality of anode layers, whereby a plurality of openings are formed over at least a portion of an anode layer, the openings corresponding to the pixel areas; wherein a side of the partitioning member contacts the substrate, wherein a second side of said partitioning member contacts an anode layer, and wherein said anode layer contacts said substrate

forming a hole injecting or transporting layer by independently filling each of the openings with a composition for the hole injecting or transporting layer using an ink-jet head, the composition comprising (1) a conductive material containing copper phthalocyanine, and (2) a solvent;

drying the composition filled in the openings to form the hole injecting or transporting layer; and

independently filling each of the openings with a light-emitting layer composition over the hole injecting or transporting layer using an ink-jet head to form the light-emitting layer, wherein a height of the hole injecting or transporting layer and the light-emitting layer is less than that of the partitioning member;

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forming a cathode layer over the light-emitting layer, wherein a film thickness of the hole injecting or transporting layer is $0.1\mu\text{m}$ or less, wherein a film resistance of the hole injecting or transporting layer is in the range $0.5 \times 10^9 \Omega/\text{m}^2$ to $5 \times 10^9 \Omega/\text{m}^2$.

Applicant respectfully submits that the cited references cannot render claim 118 obvious because the cited references fail to teach or suggest "wherein a film thickness of the hole injecting or transporting layer is $0.1\mu\text{m}$ or less, wherein a film resistance of the hole injecting or transporting layer is in the range $0.5 \times 10^9 \Omega/\text{m}^2$ to $5 \times 10^9 \Omega/\text{m}^2$ ".

The Office states that Pichler discloses the sheet resistance of hole-transporting layers in organic EL devices may be $100\text{-}10^{10} \Omega/\text{m}^2$ and that it would have been obvious to one of ordinary skill in the art to have used a sheet resistance within this range. The Applicant respectfully disagrees. The Applicant respectfully submits that what the Office regards as a hole-transporting layer, is in fact explained as an anode protection layer. For example, Pichler states that "[t]he anode protection layer is chosen to act as a barrier against the conversion by-products of the precursor polymer, but also should not act as a barrier to the injection of holes from the anode into the emitting layer..." (Pichler, p. 4, lines 23-26). Thus, Pichler's anode protection layer does not act as a layer for increasing the mobility of holes, but rather a layer functioning as a barrier. There is no teaching or suggestion in Pichler about a hole-transporting layer. Furthermore, CuPc is not disclosed at p. 5 in Pichler. Therefore, Pichler fails to provide a person of ordinary skill in the art the motivation to optimize the hole/injection/transportation layer by employing CuPc.

Moreover, the Office states that Pichler discloses the claimed sheet resistance, but the Applicant respectfully submits that Pichler merely discloses that

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"[t]ypical sheet resistances of these layers are 100-1000 ohm/square, but can be as high as in excess of 10^{10} Ω /sq." (Pichler, p. 4, lines 33-35). Pichler's disclosure never suggests that the claimed range of sheet resistance is optimal. One of ordinary skill in the art would have considered the range disclosed in Pichler as a typical one, but would have been discouraged to conceive of the claimed range based upon Pichler's disclosure.

In light of the foregoing, Applicant respectfully submits that the cited references could not have rendered claim 113 obvious, because the combination of references fails to teach or suggest each and every claim limitation. Claims 114-126 depend from claim 113 and as such include all the limitations of claim 113, and therefore, cannot be made obvious for at least the same reasons as claim 113. Withdrawal of these rejections is thus respectfully requested.

Claims 113-126 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Nagayama et al. (U.S. Patent No. 5,701,055) in view of Woo et al. (U.S. Patent No. 6,169,163) and Wilson et al. (U.S. Patent No. 5,994,835). The Applicant respectfully traverses this rejection.

Nagayama and Woo cannot render claims 113-126 obvious for the reasons discussed above. The Office relies on Wilson for teaching the claimed resistance range stating that Wilson teaches that the resistance of hole-transporting layers in organic EL devices affects the current density for a given bias voltage. The Office further states that the resistance is a result effective variable and hence the discovery of an optimum value is within the skill in the art. The Applicant respectfully disagrees.

The present invention teaches the criticality of the claimed range. Luminance values found in Table 13 at p. 24 of the Applicant's specification are the most favorable when the resistances are within the claimed range, thus

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demonstrating the criticality of the claimed range. Therefore, resistance in the context of the present invention cannot be a result effective variable given the criticality of the range taught by the present invention.

MPEP 2144.05(II)B states,

"A particular parameter must first be recognized as a result-effective variable, i.e., a variable which achieves a recognized result, before the determination of the optimum or workable ranges of said variable might be characterized as routine experimentation."

The Applicant respectfully submits that there is nothing in the cited references to indicate that results of the present invention could be achieved by optimizing the resistance. Consequently, the resistance of the present invention does not satisfy the result-effective variable requirements.

In light of the foregoing, Applicant respectfully submits that the cited references could not have rendered claims 113-126 obvious, because the combination of references fails to teach or suggest each and every claim limitation. Withdrawal of this rejection is thus respectfully requested.

Claims 37-44, 62, 83-89, and 113-126 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Nagayama in view of Woo and Pichler, as applied to claim 113, above, and further in view of Miyashita et al. (U.S. Patent No. 6,863,961 or its international application publication WO98/24271). The Applicant respectfully traverses this rejection.

Claims 37-44, 62, 83-89, and 113-126 require a film thickness of the hole injecting or transporting layer to be $0.1\mu\text{m}$ or less, and a film resistance of the hole injecting or transporting layer to be in the range $0.5 \times 10^9 \Omega/\text{m}^2$ to $5 \times 10^9 \Omega/\text{m}^2$, and are therefore, patentable over Nagayama, Woo and Pichler for the reasons discussed above. Miyashita cannot remedy the defect of Nagayama, Woo and

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Pichler and is not relied on by the Office for such. Instead, the Office cites Miyashita for teaching that hole-transporting layers may be deposited by ink jet printing and that the ink-jet compositions of the invention use solvents.

In light of the foregoing, Applicant respectfully submits that the cited references could not have rendered claims 37-44, 62, 83-89, and 113-126 obvious because the cited references fail to teach or suggest each and every claim limitation. Withdrawal of this rejection is thus respectfully requested.

Claims 37-44, 62, 83-89, and 113-126 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Nagayama in view of Woo and Wilson, as applied to claim 113, above, and further in view of Miyashita et al. (U.S. Patent No. 6,863,961 or its international application publication WO98/24271). The Applicant respectfully traverses this rejection.

Claims 37-44, 62, 83-89, and 113-126 require a film thickness of the hole injecting or transporting layer to be 0.1 μ m or less, and a film resistance of the hole injecting or transporting layer to be in the range 0.5 x 10⁹ Ω /m² to 5 x 10⁹ Ω /m², and are therefore, patentable over the cited references for the reasons discussed above. Withdrawal of this rejection is thus respectfully requested.

Claims 37-45, 48, 51, 62, 64, 66 83-90, 93, 95, and 113-126 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Nagayama in view of Woo and Pichler, as applied to claim 113, above, and further in view of Katsen et al. (U.S. Patent No. 5,746,817). The Applicant respectfully traverses this rejection.

Claims 37-45, 48, 51, 62, 64, 66 83-90, 93, 95, and 113-126 require a film thickness of the hole injecting or transporting layer to be 0.1 μ m or less, and a film resistance of the hole injecting or transporting layer to be in the range 0.5 x 10⁹ Ω /m² to 5 x 10⁹ Ω /m², and are therefore, patentable over Nagayama, Woo and Pichler for the reasons discussed above. Katsen cannot remedy the defect of

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Nagayama, Woo and Pichler and is not relied on by the Office for such. Instead, the Office cites Katsen for teaching that ink-jet compositions may have weight percents of 2-10 weight percent.

In light of the foregoing, Applicant respectfully submits that the cited references could not have rendered claims 37-45, 48, 51, 62, 64, 66 83-90, 93, 95, and 113-126 obvious because the cited references fail to teach or suggest each and every claim limitation. Withdrawal of this rejection is thus respectfully requested.

Claims 37-45, 48, 51, 62, 64, 66 83-90, 93, 95, and 113-126 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Nagayama in view of Woo and Wilson, as applied to claim 113, above, and further in view of Katsen et al. (U.S. Patent No. 5,746,817). The Applicant respectfully traverses this rejection.

Claims 37-45, 48, 51, 62, 64, 66 83-90, 93, 95, and 113-126 require a film thickness of the hole injecting or transporting layer to be $0.1\mu\text{m}$ or less, and a film resistance of the hole injecting or transporting layer to be in the range $0.5 \times 10^9 \Omega/\text{m}^2$ to $5 \times 10^9 \Omega/\text{m}^2$, and are therefore, patentable over the cited references for the reasons discussed above. Withdrawal of this rejection is thus respectfully requested.

Claims 46, 47, 49, 91, 92, 94, 122, 123, and 125 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Nagayama in view of Woo, Pichler, and Katsen as applied to claims 37, 62, and 113, above, and further in view of Ogino et al. (U.S. Patent No. 5,489,671). The Applicant respectfully traverses this rejection.

Claims 46, 47, 49, 91, 92, 94, 122, 123, and 125 require a film thickness of the hole injecting or transporting layer to be $0.1\mu\text{m}$ or less, and a film resistance of the hole injecting or transporting layer to be in the range $0.5 \times 10^9 \Omega/\text{m}^2$ to $5 \times 10^9 \Omega/\text{m}^2$, and are therefore, patentable over Nagayama, Woo, Pichler, and Katsen for the reasons discussed above. Ogino cannot remedy the defect of Nagayama, Woo,

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Pichler, and Katsen and is not relied on by the Office for such. Instead, the Office cites Ogino for teaching that methanol, ethanol, or ethoxyethanol are known water-miscible compounds usable in aqueous ink-jet inks.

In light of the foregoing, Applicant respectfully submits that the cited references could not have rendered claims 46, 47, 49, 91, 92, 94, 122, 123, and 125 obvious because the cited references fail to teach or suggest each and every claim limitation. Withdrawal of this rejection is thus respectfully requested.

Claims 46, 47, 49, 91, 92, 94, 122, 123, and 125 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Nagayama in view of Woo, Wilson, and Katsen as applied to claims 37, 62, and 113, above, and further in view of Ogino et al. (U.S. Patent No. 5,489,671). The Applicant respectfully traverses this rejection.

Claims 46, 47, 49, 91, 92, 94, 122, 123, and 125 require a film thickness of the hole injecting or transporting layer to be $0.1\mu\text{m}$ or less, and a film resistance of the hole injecting or transporting layer to be in the range $0.5 \times 10^9 \Omega/\text{m}^2$ to $5 \times 10^9 \Omega/\text{m}^2$, and are therefore, patentable over the cited references for the reasons discussed above. Withdrawal of this rejection is thus respectfully requested.

In view of the foregoing, it is respectfully submitted that the application is in condition for allowance. Reexamination and reconsideration of the application, as amended, are requested.

If for any reason the Examiner finds the application other than in condition for allowance, the Examiner is requested to call the undersigned attorney at the Los Angeles, California telephone number (213) 337-6809 to discuss the steps necessary for placing the application in condition for allowance.

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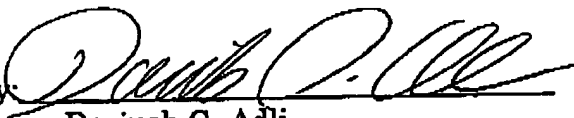
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If there are any fees due in connection with the filing of this response, please charge the fees to our Deposit Account No. 50-1314.

Respectfully submitted,
HOGAN & HARTSON L.L.P.

Date: September 6, 2005

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